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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
E03B 5/02, 7/00, A62C 35/64

A1

(11) International Publication Number: WO 99/66137

(43) International Publication Date: 23 December 1999 (23.12.99)

(21) International Application Number: PCT/AU99/00502

(22) International Filing Date: 18 June 1999 (18.06.99)

(30) Priority Data:
PP 4206 18 June 1998 (18.06.98) AU

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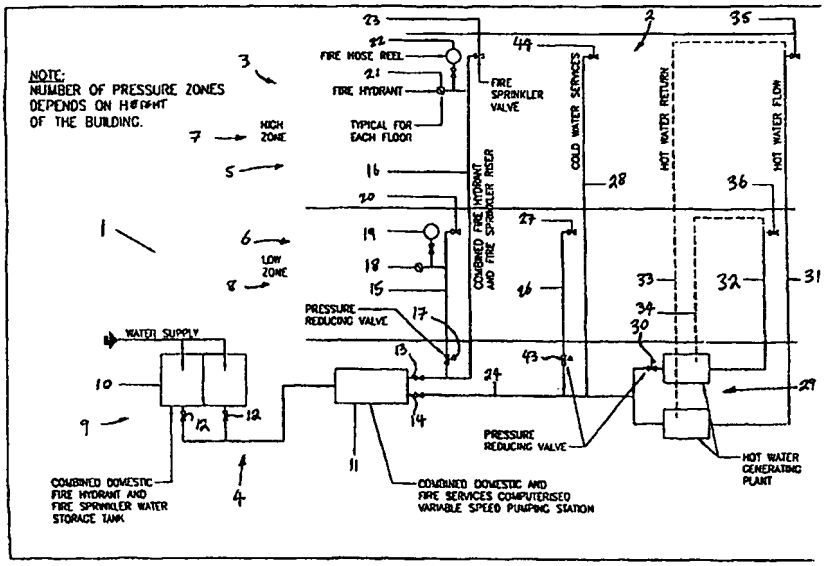
(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: WATER SUPPLY APPARATUS

SINGLE SOURCE WATER SUPPLY SYSTEM



(57) Abstract

The apparatus (1) includes a domestic water reticulation means (2) and a fire water reticulation means (3). The domestic water reticulation means (2) and the fire water reticulation means (3) are connected to a single water source (4), in parallel with each other. The apparatus (1) is mounted in a multi–storey building. The building is divided up into two pressure zones, namely a high zone (5) and a low zone (6). It follows that the reticulation means (2, 3) are divided into a higher reticulation level (7) and lower reticulation level (8).

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WATER SUPPLY APPARATUS

This invention relates to water supply apparatus for supplying water services, eg fire water, cold water and hot water to a water usage area.

This invention finds particular application in high rise residential or office buildings, eg buildings of ten or more stories and it will be convenient to herein describe the invention with reference to this application. However it is to be clearly understood that the invention is capable of broader application, eg industrial buildings.

In this specification, reference to domestic water is to be understood to refer to water which is suitable for ablutions and consumption, such as bath, kitchen and laundry water. Further, reference to fire water is to be understood to refer to water for fire-fighting such as fire hose water and for sprinkler water.

Currently multi-storey buildings have several discrete and separate water supply apparatus for the three different water supplies in the building, for example domestic water supply and fire water supply in the form of fire sprinkler supply and fire hydrant supply. Each of these discrete water supplies has its own storage tank, its own pump and its own reticulation. Clearly, therefore, duplication of tanks, pumps and reticulation with this set-up is high and substantial cost savings could be realised if somehow this duplication of apparatus could be rationalised or reduced.

According to an aspect of this invention, there is provided a water supply apparatus for a water usage area, the apparatus including:

a fire water reticulation means;

a domestic water reticulation means; and

a water supply means for supplying water to the water usage area, the fire reticulation means and the domestic water reticulation means being operatively coupled to the water supply means.

Typically, a multi-storey building is divided up into a plurality of pressure zones at different heights in the building, the number of zones being dependant on the height of the building.

There will usually be at least two zones, namely a high zone and a low zone. Typically the apparatus has a separate pressure zone for each 12 to 18 floors of the building. The extent of the pressure zone depends on the maximum and minimum pressures permitted for water supply at individual points within the building.

The domestic water reticulation means and the fire water reticulation means may be divided into a lower reticulation zone and at least one upper reticulation zone, the lower reticulation zone being mountable in a lower portion of the building, and the, or each, upper reticulation zone being mountable in a respective upper zone of the building.

In particular, and for convenience of description, the domestic water reticulation means and the fire water reticulation means may be divided into a lower reticulation zone and an upper reticulation zone.

The water supply apparatus may include a water storage means, in which water for the domestic water reticulation means and for the fire water reticulation means is stored. Preferably, the water supply apparatus includes a single water storage means. The water storage means may include at least one water tank.

The water supply apparatus may also include a pumping means, which is arranged in fluid communication between the water storage means and the domestic and fire water reticulation means to pump water through the domestic and fire water reticulation means.

The pumping means may include one pumping station, which is arranged in fluid communication between the water storage means and both the lower and

upper zones of the domestic and fire water reticulation means to pump water to both the lower and upper reticulation zones.

Instead, the pumping means may include at least two pumping stations, a pumping station being arranged in fluid communication between the water storage means and each respective reticulation zone of the domestic and fire water reticulation means to pump water to each reticulation zone, respectively.

Thus, in both the above examples, the same pumping means is used to pump both domestic and fire water around the building.

It follows that the single water storage means and a single pumping means is used to pump water for both domestic water services and fire fighting water services to all points within the building and it is not necessary to have the normal three discrete pumping means and three discrete water tanks.

Each pumping station may include a number of pump sets, each pump set including a pump and a motor. Each pump set may be of the type which is of variable speed and which is controllable via a suitable electronic processor. The electronic processor may be capable of performing continual analysis of the pressure and volumetric flow of water. Typically, each motor may be an electric motor. Further, each pump may be typically a centrifugal pump, for example, a multi-stage centrifugal pump.

The water supply apparatus may include a sensing means for sensing pressure and flow characteristics of water pumped from the, or each, pumping station.

Further, the apparatus may include a control means for controlling the pressure and flow characteristics of the water pumped from the, or each, pumping station. The control means may be operable on receipt of a signal from the sensing means.

Where one pumping station is used, the water supply apparatus may include a water conduit means arranged in fluid communication between the pumping

station and each reticulation zone of the domestic and fire water reticulation means.

Where two or more pumping stations are used, the water supply apparatus may include a water conduit means arranged in fluid communication between each pumping station and its respective reticulation zone of the domestic and fire water reticulation means.

The domestic water reticulation means may include a cold water reticulation means and a hot water reticulation means.

The water supply apparatus may include a hot water generating means. The hot water generating means may comprise a boiler and a hot water storage means.

However, in some apparatus there is no hot water generating means and therefore no hot water reticulation means. Cold water is then heated at individual points within the building to provide hot water supply. The, or each, water tank may be positioned proximate a base of the building. The pumps may also be located proximate a base of the building.

Typically the apparatus further includes fire hose reels, fire hydrants, and fire sprinkler valves on each storey of the building, the said hydrants, reels and valves being operatively connected to the fire water reticulation means.

Typically the apparatus further includes valves or taps and the like on each floor operatively connected to the domestic water reticulation means.

Naturally the apparatus may also include pressure reducers and other accessories and components which one would expect associated with water pumps.

According to a further aspect of the invention, there is provided a water supply apparatus for reticulating water services to a multi-storey building. The apparatus including:

a water storage means for storing water to be reticulated;

a water pumping means operatively communicating with the water in the water storage means by means of a conduit means;

a domestic water reticulation means for reticulating domestic water to various levels of the building operatively connected to the water pumping means; and

a fire water reticulation means for reticulating fire water to various levels of the building also operatively connected to the water pumping means.

The domestic water reticulation means may include a plurality of zones corresponding to different levels of height in the building, including a relatively lower reticulation zone for servicing a relatively lower level of the building and a relatively higher reticulation zone for servicing a corresponding relatively higher level of the building, and wherein the fire reticulation means also includes a plurality of zones corresponding to different levels in the building, including a relatively lower reticulation zone for servicing a relatively lower level of the building, and a relatively higher reticulation zone for servicing a corresponding relatively higher level of the building.

The pumping means may include a relatively higher pressure pumping station and a relatively lower pressure pumping station, wherein said lower reticulation zones of said fire water and domestic water reticulation means are operatively coupled to said relatively lower pressure pumping stations, and said upper reticulation zones of said domestic and fire water reticulation means are operatively coupled to said relatively higher pressure pumping stations.

Thus, a higher pressure pumping means is used to pump both domestic water and fire water to higher levels of the building and a lower pressure pumping means is used to pump both domestic and fire water to the lower levels of the building.

The pumping means may deliver water at a single delivery pressure for use throughout the building and wherein pressure reducing means are operatively coupled in line with said lower reticulation portion of said domestic water and fire reticulation means for limiting the water supply in said lower portions within predetermined pressure limits.

The water pumping means may draw water from a common water storage means.

Water supply apparatus in accordance with this invention may manifest itself in a variety of forms. It will be convenient to hereinafter describe in detail two embodiments of the invention to instruct persons interested in the subject matter of the invention how to carry out the invention. It is to be clearly understood however that the specific nature of this description does not supersede the generality of the preceding statements. In the drawings:

FIG. 1 is a schematic flow sheet of a first embodiment of a water supply apparatus in accordance with the invention;

FIG. 2 is a schematic flow sheet of a second embodiment of a water supply apparatus in accordance with invention;

FIG. 3 is a schematic flow sheet of a pumping station of the first embodiment of the water supply apparatus; and

FIG. 4 is a schematic flow sheet of a water storage means for either of the apparatus of Fig. 1 or Fig. 2.

In Fig 1, reference 1 generally indicates a first embodiment of a water supply apparatus, in accordance with the invention.

The apparatus 1 includes a domestic water reticulation means 2 and a fire water reticulation means 3. The domestic water reticulation means 2 and the fire water reticulation means 3 are connected to a single water source 4, in parallel with each other.

The apparatus 1 is mounted in a multi-storey building (not shown). The building is divided up into two pressure zones, namely a high zone 5 and a low zone 6. It follows that the reticulation means 2, 3 are divided into a higher reticulation level 7 and a lower reticulation level 8.

Each zone 5, 6 includes, in this example, seventeen floors of the building. It will be appreciated that the size of the zones 5, 6 depends on the maximum and minimum pressures permitted for water supply at individual points within the building.

The apparatus 1 includes a water storage means 9 in which water for both reticulation means 2, 3 is stored. The water storage means 9 includes a pair of water tanks 10.

The apparatus 1 includes a pumping means in the form of a pumping station 11. The pumping station 11 is arranged in fluid communication between the water tanks 10 and the water reticulation means 2, 3. In particular, an inlet of the pumping station 11 is in fluid communication with the water tanks 10 via valves 12.

The pumping station 11 has a pair of valved outlets 13, 14. One of the valved outlets 13 is in fluid communication with the fire water reticulation means 3 via a first fire water conduit 15 and a second fire water conduit 16. The first fire water conduit 15 directs fire water to the lower reticulation zone 8 while the second fire water conduit 16 directs fire water to the higher reticulation zone 7. A pressure reducing valve assembly 17 is positioned in the first fire water conduit 15 to reduce the pressure of the fire water supply to the lower reticulation zone 8. The valve assembly 17 is such that the pressure is reduced to an acceptable level for fire water use in the building.

A fire hydrant 18, a fire hose reel 19 and a fire sprinkler valve 20 are each connected to the first fire water conduit 15.

Similarly, a fire hydrant 21, a fire hose reel 22 and a fire sprinkler valve 23 are connected to the second fire water conduit 16. Thus, the devices 18 to 20 are positioned in the lower zone 6 of the building while the devices 21 to 23 are positioned in the higher zone 5 of the building.

The valve outlet 14 is connected to the domestic water reticulation means 2 via a primary domestic water conduit 24.

A first subsidiary domestic water conduit 26 is connected to the primary domestic water conduit 24 to direct water to the lower reticulation zone 8. A valve or stopcock 27 is mounted in the first subsidiary conduit 26.

A pressure reducing valve assembly 43 is mounted in the first subsidiary water conduit 26. The valve assembly 43 is such that the pressure is reduced to an acceptable level for domestic use.

A second subsidiary domestic water conduit 28 is also connected to the primary domestic water conduit 24 to direct water to the higher reticulation zone 7. A valve or stopcock 44 is mounted in the conduit 28.

In Fig. 3 there is set out a schematic flow sheet of the pumping station 11.

The pumping station 11 includes an inlet manifold 45 which is connected to the tanks 10 via the valves 12. Four primary pumps 46 are connected, in parallel, to the inlet manifold 45. A subsidiary, or jockey pump 47 is also connected to the inlet manifold 45, in parallel with the primary pumps 46. The pumps 46, 47 are all connected, in parallel to an outlet manifold 48.

The valved outlets 13, 14 are connected, in parallel, to the outlet manifold 48. The valved outlet 13 includes a flow switch 50 and an isolating valve 51 positioned downstream of the flow switch 50.

The valved outlet 14 includes a motorised cold water isolating valve 52. The valve 52 is operable, remotely, to control, or cut off, the flow of cold water from

the outlet manifold 48. The valved outlet 14 also includes a manual isolating valve 53 positioned downstream of the valve 52.

The pumping station 11 includes a control system 54 to control the flow of water through the outlet manifold 48. The system 54 includes a flow indicator 55, a pressure relief valve 56 and a flow measuring device 57.

The devices 55, 56 and 57 are mounted in a water feedback line 58 which is connected between the outlet manifold 48 and an inlet of the tanks 10. The flow measuring device 57 is mounted in series with the line 58 while the flow indicator 55 and the pressure relief valve 56 are mounted in parallel to the line 58.

It will be appreciated that, by using the system 54, a level of control over the water flow from the outlet manifold 48 can be achieved via the valve 52 and the flow switch 50. The valve 52 and the flow switch 50 can be operable on signals generated by the devices 55, 56 and 57.

In Fig. 4, there is shown a schematic flow sheet of the water storage means 9.

The water storage means 9 includes a pair of float valves 59. A float valve 59 is positioned in each water tank 10 to ensure that a maximum level 63 of water in the tanks 10 is not exceeded.

A manually operable valve 60 is positioned on each tank 10 so that water can be supplied to the tanks 10, manually, in the event of a system failure.

The storage means 9 further includes an electrically driven valve 61 mounted in each tank 10. An electronic level control device 62 is connected to each valve 61 so that the level within the tanks 10 can be controlled electronically.

As can be seen in Fig. 4, the electronic level control device 62 is configured to ensure that the water level in the tanks 10 does not fall below a minimum level 64 for domestic water supply. Further, at a level 65 below the minimum level 64

for the domestic water supply, an alarm will be triggered via a signal generated by the device 62. Water below the level 65 is reserved for the fire water reticulation means 3.

The valves 59, 60 and 61 are connected to a water mains line 66.

The apparatus 1 includes a hot water generating plant 29 in the form of a boiler for heating the water. The plant 29 is connected to the primary water conduit 24 via a suitable arrangement which includes a pressure reducing valve 30. The plant 29 is in the form of a conventional boiler which would be well known to persons skilled in the art and will not be described in further detail in the specification.

First and second hot water conduits 31 and 32 direct hot water to the higher and lower reticulation zones 7,8 respectively. Hot water return conduits 33, 34 are connected to the conduits 31 and 32, respectively, to circulate water back to the plant 29. A valve or stopcock 35 is connected to the hot water conduit 31 while a valve or stopcock 36 is connected to the hot water conduit 32.

In Fig. 2 reference 40 generally indicates a second embodiment of a water supply apparatus, in accordance with the invention. With regard to Fig. 1, like reference numerals refer to like parts, unless otherwise specified.

The main difference between the apparatus 1 and the apparatus 40 lies in the pumping means. The apparatus 40 has two pumping stations 41 and 42 which are connected together in parallel whereas the apparatus 1 has only one pumping station 11. The pumping station 41 serves to pump both domestic and fire water to the lower reticulation zone 8. The second pumping station 42, by contrast, pumps both domestic and fire water to the higher reticulation zone 7. It follows that the pumping stations 41, 42 have different pumping characteristics. The pumping station 42 provides both fire water and domestic water at a delivery head which is greater than that provided by the first pumping station 41.

The first and second pumping stations 41, 42 are suitable for situations where a user is required to specifically tailor the characteristics of the water supplied to the different water reticulation zones 7, 8.

It will be appreciated that, with the apparatus 40, the pressure reducing valve assemblies 17, 43 are not required. Thus, the provision of the pumping stations 41, 42 provides flexibility of operation since the pressure flow characteristics of the higher and lower zones 7,8 can be altered independently of each other.

The apparatus 1, 40 includes a means for inhibiting cross-contamination of fire water and domestic water. Such a means can for example be in the form of a suitable valve arrangement.

In order to further illustrate the invention, an appendix is attached, merely by way of a particular example. The detailed and specific nature of the appendix should in no way detract from the broad concept of this invention.

A particular advantage of the apparatus 1, 40 is that the reticulation means 2, 3 is such that water to the reticulation means 2, 3 can be supplied from a single source. It will be appreciated that this leads to substantial savings in the costs of building and maintenance as only one tank and one pumping system will have to be supplied and/or maintained.

A further particular advantage of the apparatus 1, 40 is that the pumps are in use continually. As a result, the performance of these pumps can be tested continually and kept in sound working order.

Other subsidiary advantages are that no water storage tank is required on a roof of the building. Further, no domestic pressurising pumps, fire hydrants and fire sprinkler pumps are required on the roof.

The running costs of the apparatus 1, 40 are lower than similar apparatus presently used. The reason for this is, as set out before, that only one pump system and one water supply system is required. The arrangement of the

reticulation means 2, 3 and the pumps is such that domestic operating pressure and fire operating pressure can be supplied to the reticulation means 2,3 via a single pumping system.

Furthermore, there are lower power generator start-up requirements due to the arrangement of the pump sets. The constant pressure supplied by the pumps result in an elimination of water hammer.

Most buildings have an auxiliary power generator in the event of power failure. As a result of only a single pump system being utilised, it is a simple matter to ensure that the pump systems are kept operational in the event of a power failure. Thus, the fire water reticulation means is kept operational even though a fire may have disrupted the main power supply.

At present, a multi-storey building usually has water supply tanks positioned at each of a number of service levels and on the roof of the building. Water from a mains is pumped to the tanks. The water for those levels in the building immediately beneath the service levels and the roof must be pressurised by pumps to achieve a desired pressure. It is therefore necessary for such buildings to have pressurising pumps installed in addition to the pumps used for pumping water to the supply tanks.

It will be appreciated that the invention provides a means whereby this duplication of pumps is lessened with a resultant large saving in costs and time consumption.

A further disadvantage with the systems presently in use is that separate water supplies for domestic and fire water result in separate equipment being utilised. This results in duplication of contractual work, such as maintenance.

It is clear from the above description that this invention serves to lessen such duplication of work. The main reason for this is that a single pumping means provides sufficient pressure for both domestic and fire water supply.

A particular advantage of this invention is that the control system 54 facilitates electronic and remote control over the apparatus 1, 40. This has the effect of enhancing the efficiency of the apparatus 1, 40. A reason for this is that operation of the apparatus 1, 40 can be adjusted to suit fluctuating demands on domestic and fire water supply. Further, the fact that the apparatus 1, 40 can be remotely controlled permits the apparatus 1, 40 to be used with a plurality of buildings in a particular water usage area.

It will of course be realised that the above has been given only by way of illustrative example of the invention and that all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as is herein set forth.

APPENDIX

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SECTION A

PUMPING SYSTEM DESCRIPTION

- BRIEF
- HISTORY
- DESIGN PROPOSAL
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- PUMP SELECTION
- DESIGN SAFETY
- POWER FAILURE
- FIRE SWITCH ACTIVATION
- FAULT MODES
- SYSTEM ADVANTAGES

BRIEF

This design is utilising a single source water supply to provide water to the following services within "Renaissance on George" Residential Towers.

- Domestic Cold and Hot Water Services
- Fire Hydrant System
- Fire Hose Reels
- Fire Sprinkler System

HISTORY

Previous water supplies to buildings have been segregated into 3 specific sections with separate pumps operating

- Domestic Water Supply Pumps
- Fire Hydrant Pumps
- Fire Sprinkler Pumps

The reason for the separations is to comply with the Fire Codes.

AS2941 – Fixed Fire Protection Installations
AS2419 – Fire Hydrant Installations
AS2118 – Code for Automatic Fire Sprinkler Systems
Each of these codes requires similar pumping requirements but require individual pumping plants.

There are 2 very important reasons to consider a joint domestic and fire water supply:

1. Using the hydraulic supply on a regular basis would proof the pumping plant for emergency situations.
2. The degree of complexity would be lowered to enable the system to cope with demand.

DESIGN PROPOSAL

The proposal of this design is to combine the required operation on Fire and domestic requirements into one basic pumping plant utilising Variable Speed drive controllers to match the flow rate and pressures required with the system demands.

Each building is split into multiple zones to restrict the maximum head limitation being exceeded for any requirements. Fire piping would be separated from hydraulic pipes as shown on Drawing No. 5 and run via the standard pipe routes.

A system of multiple pumps and VFD controllers would provide the booster requirements for specific zones within a building as per Drawing No. 1 & 3.

Zone	Pressure Range	Static Height Range	Storeys
	kPa	m	
1	350-950	0-50	0-16
2	950-1450	50-100	17-31
3	1450-1950	100-150	32-47
4	1950-2500	150-200	48-65

Table 1

The table above shows the range of pressures typically required between zones. This allows the domestic and fire requirements to be met as per the relevant standards. The flow rates required are typically set by the case of both hydrant and sprinkler fire requirement being met at once. In this case the hydraulic water requirements can be met by the use of multi-pump variable speed drive systems.

FLOW AND PRESSURE REQUIREMENTS

A. Cold Water & Fire Services

A 31 and 27 storey building requires a single supply pumping plant to cover all requirements.

Height between storeys	2.9m
Domestic requirement	34.6l/s
Fire Hydrant & Hose Reels	20.0l/s
Fire Sprinklers	10.0l/s

1. Flow Requirements

	Tower 1		Tower 2		Both Towers
	Zone 1	Zone 2	Zone 1	Zone 2	Zone 1 & 2
	l/s	l/s	l/s	l/s	l/s
Domestic requirements	11.0	10.0	10.0	10.0	35.0
Hydrant & Hose Reel	20.0	20.0	20.0	20.0	20.0
Sprinkler	10.0	10.0	10.0	10.0	10.0
Fire Total	30.0	30.0	30.0	30.0	30.0
+50% to comply with AS2419.1	45.0	45.0	45.0	45.0	45.0 @ 1000kPa

Table 2

2. Pressure Requirements

	Tower 1		Tower 2	
	Zone 1	Zone 2	Zone 1	Zone 2
	kPa	kPa	kPa	kPa
Domestic supply min	50	50	50	50
Hydrant supply min	350	350	350	350
Sprinkler service min	400	400	400	400
Static	650	1140	650	1020
Maximum heads	1050	1540	1050	1420

Table 3

Pump duties for worst case are:

Normal operation:

Zone 1	21.0l/s	vs	800kPa
Zone 2	20.0l/s	vs	1270kPa
Max	35.0l/s	vs	1270kPa

Fire mode:

Zone 1	30l/s	vs	1050kPa
Zone 2	30l/s	vs	1540kPa
+50%	45l/s	vs	1000kPa
Max	40l/s	vs	950kPa

B. Central Hot Water Service

1. Flow Requirements

	Tower 1		Tower 2		Both Towers
	Zone 1	Zone 2	Zone 1	Zone 2	Zone 1 & 2
	l/s	l/s	l/s	l/s	l/s
Domestic requirements	11.0	7.5	10.0	7.5	29.8

Table 4

2. Pressure Requirements

	Tower 1		Tower 2	
	Zone 1	Zone 2	Zone 1	Zone 2
	kPa	kPa	kPa	kPa
Domestic supply min	50	50	50	50
Static	650	1080	650	980
Maximum heads	800	1270	800	1150

Table 5

PUMP SELECTION

A. Cold Water & Fire Services

Maximum Duties:
Zone 1 30.0l/s vs 1050kPa
Zone 2 30.0l/s vs 1540kPa

The pump layout is detailed in the graphic on Drawing No. 5

Our pump selection is based on the utilisation of 4 pumps available for operation for the worst case scenario.

Pump selection duty 12.0l/s vs 1600kPa

The only other pump selection criterion is the sphere size passing for the pump is 8mm as the flow is below 1890 l/m.

The selected pumps are:

One Southern Cross Ultimate Model "Dolphin" 4 pump (3 Duty & 1 Stand by) and jockey pump variable frequency drive control panel to suit 30.0 kW motors 3 phase 50 HZ complete with:

4 Southern Cross Model ME40, 30.0 kW cast iron VMS pumps 3 phase 50 HZ
1 Southern Cross Model SV16, 15.0 kW jockey pump fitted with GW-VF drive.

B. Central Hot Water Service

Maximum Duties:

Zone 1	21.0l/s	vs	800kPa
Zone 2	15.0l/s	vs	1270kPa

The pump layout is detailed in the graphic on Drawing No. 6.

Our pump selection is based on the utilisation of 5 pumps available for operation for the worst case scenario.

Pump Selection Duty 8.0l/s vs 1300kPa

The Selected pumps are:

One Southern Cross Ultimate Model "Dolphin" 5 pump (4 Duty & 1 Stand by) 2 jockey pumps variable frequency drive control panel to suit 22.0 kW motors 3 phase 50 HZ complete with:

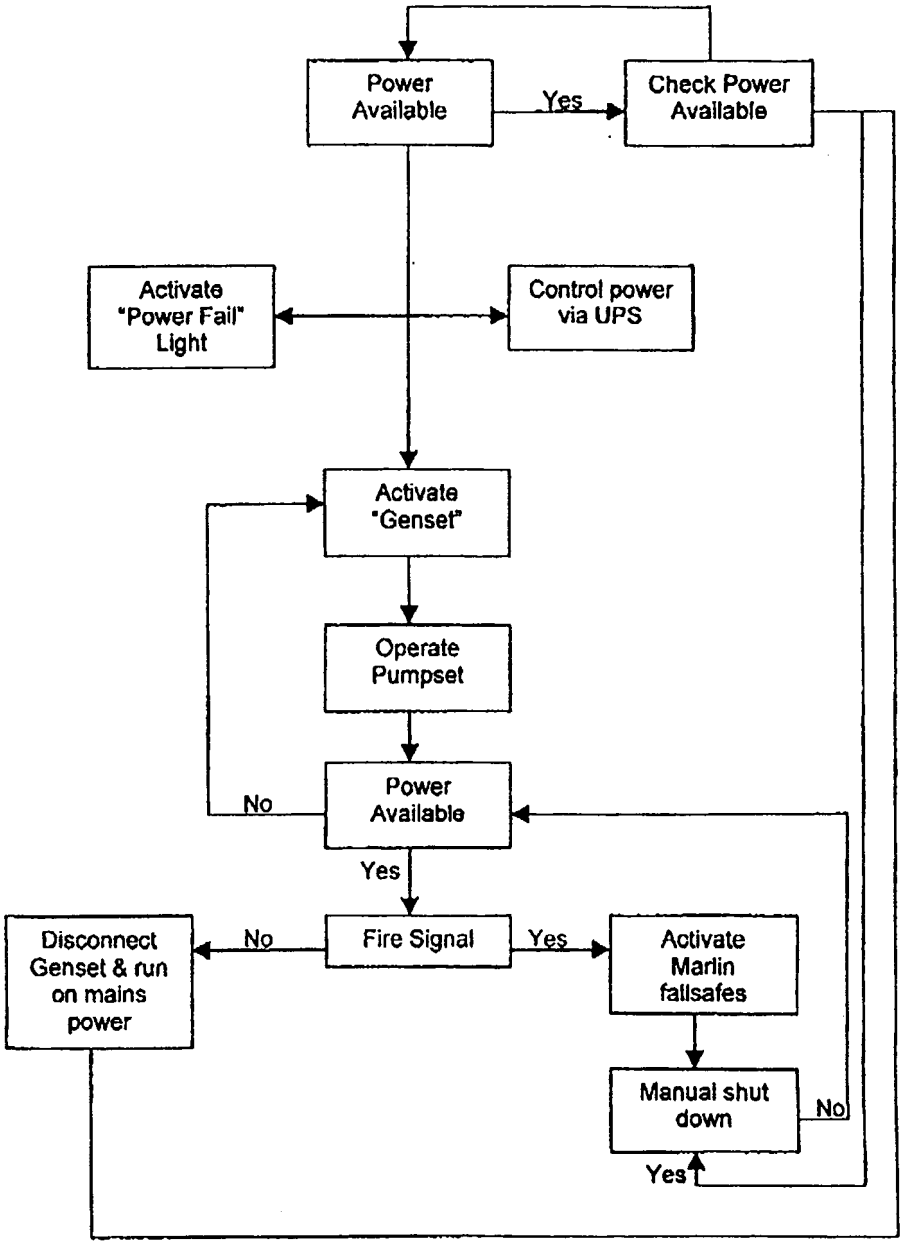
5 Southern Cross Model SV30, 22 kW pumps 3 phase 50 HZ fitted to above unit. 2 Southern Cross Model SV16, 15.0 kW jockey pumps fitted with Great White DSB alternating duty VF drive.

DESIGN SAFETY'S

There are a number of design safety's built into the system which comply with the relevant Australian Standards for Water Supply and Fire Codes.

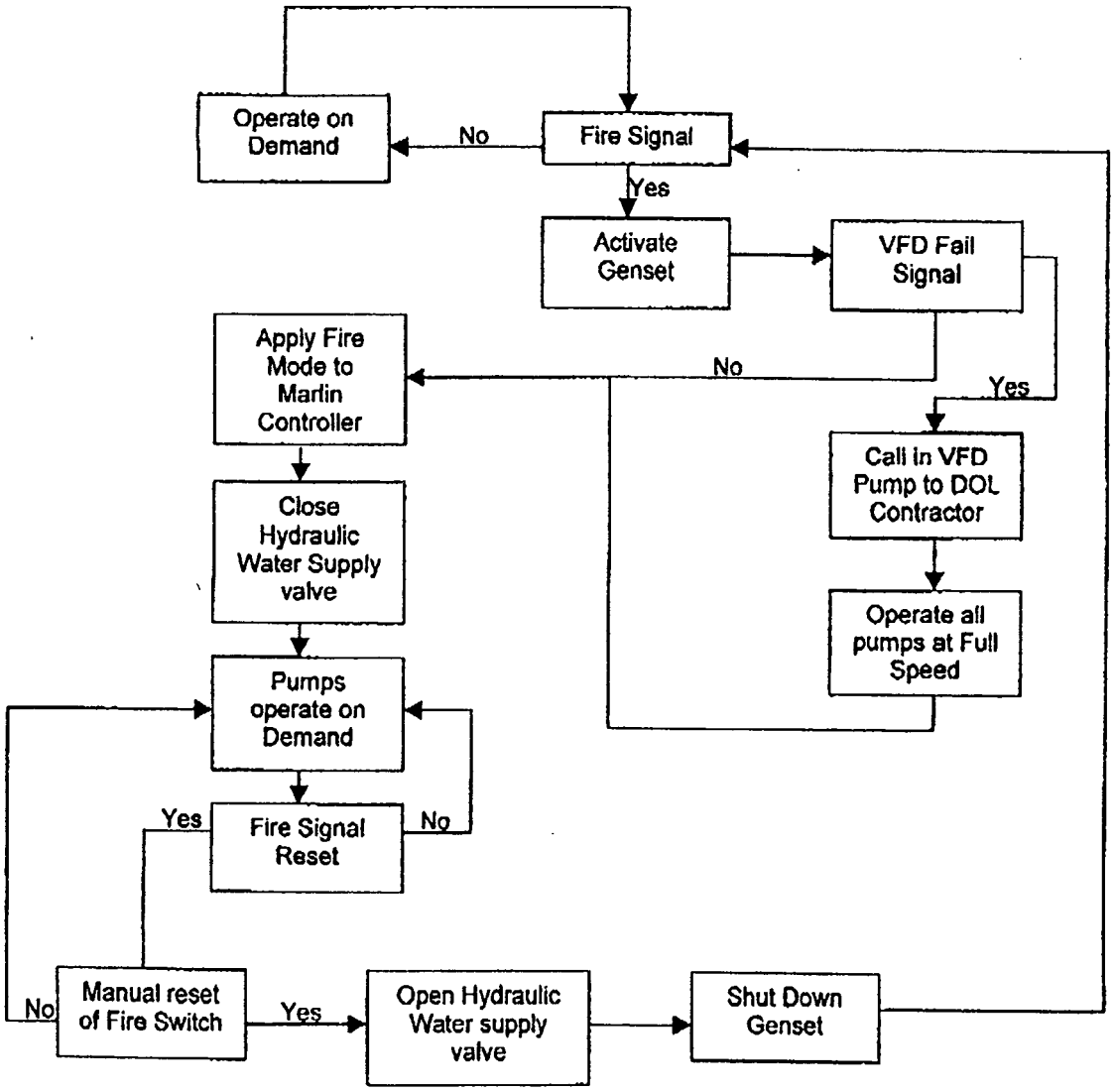
POWER FAILURE

A backup gen-set is provided to supply power in case of a mains power failure. The control procedure is detailed in the flow chart. The main consideration is that if a fire is active when the power fails then the gen-set will continue to function until manually reset, if a fire is not present the system reverts to mains power in case of resumption of mains power.



FIRE SWITCH ACTIVATION

In case of the fire switch activating the following process will operate. The Marlin controller receives a "FIRE" signal to which the controller will ignore any signal that tells the pump-station to go into shutdown mode. In this mode the Low Pressure & High Pressure shutdown will not activate. In case of a VFD failure the system will operate at full speed with all pumps on DOL contractor operation.



FAULT MODES

The system has been designed to accommodate the requirements of the relevant codes and also to indicate the actual system status of the Pump-Station. Listed in Table 6 are all the indicators and modes of system faults that are indicated on the Marlin interface and on the switchboard door.

Fault Mode	Indicator	Action
Low water supply in storage tank	Light to front panel alarm to supervisor	Pause system until water supply at suitable level
Battery charger supply fail	Red light front panel	Indicate only
Fire mode	Red light to front panel, sound audible alarm, PCB flash "FIRE"	Indicate only
Power Supply present	Green light to front panel	Indicate only
Low Pressure	PCB Indicator	Shut down system if fire mode disabled. If fire mode activated whilst in shut down, Start system
High Pressure	PCB Indicator	Shut down system if fire mode disabled. If fire mode activated whilst in shut down, Start system
Phase failure	Red light front panel	Activate gen-set
Light Test	All lamps illuminate	Indicate only

Table 6

Indicators to Front Panel:

1. Ammeter with 3-phase switch for each pump inc jockey pump.
2. Control battery ammeter & Voltmeter.
3. Crank battery ammeter & Voltmeter.
4. UPS Status.
5. Hour run meter for each main pump.

SYSTEM ADVANTAGES

As with all Variable speed pumping systems the major advantages are the utilisation of these systems are:

- Lack of Water Hammer
- Considerably lower running costs
- Even pressure distribution
- Lack of transmitted noise throughout the building
- Compliance with all Standards
- Fast response without water hammer

The system using these applications would be the Marlin system (see Marlin inf. Sheet).

As the data shows the system can operate from effectively 0.1l/s maximum duty with changes in speed. This negates the significant problems associated with fixed speed pumps being zero flow overheating and water hammer with flow variations.

The Southern Cross system allows variation from zero flow to full flow in an adjustable time, typically less that 5 sec and from full flow to zero in less than 1 sec.

The use of multiple pumps provides an additional backup in case of pump failure, in case with a 33% reduction in case of 1 pump failure, which brings the flow back to the design max flow for the Fire system.

Notes:

1. Pumping system will be manually re-set from fire mode to normal operating conditions.
2. Stand by power generator will start automatically within 30 seconds (max) in case of power failure and after another 30 seconds will reach its full efficiency. Processor will be re-set in 30 – 60 seconds.
3. All wiring between tank, valves, other equipment and control panel will be in fire cable (pyrocable)

SECTION B

HYDRAULIC AND FIRE SERVICES DESCRIPTION

- GENERAL
- WATER SUPPLY
- DOMESTIC COLD WATER RETICULATION
- DOMESTIC HOT WATER RETICULATION
- FIRE HYDRANT AND FIRE SPRINKLER SYSTEM
- CONCLUSIONS

GENERAL

Proposed single source water supply system is designed to provide the complete water supply installation for domestic and fire fighting purposes for two residential towers.

The system is designed in accordance with all requirements of Building Code of Australia, AS2941, AS2419, AS2118, all relevant standards and local authority regulations.

WATER SUPPLY

From existing town water main water will be delivered into the central water storage tank and lower parts of the buildings ie. basements, ground and podium levels.

Water storage tank will have a total working capacity required for domestic, fire hydrant and fire sprinkler systems.

Electronic level control device will operate main water supply inlet valves, rising alarm when water level will drop below the minimum level reserved for fire fighting purposes. Fire alarm mode will automatically switch off water level alarm signal. Water storage tank is divided in order to provide min50% of total storage capacity all the time. Float valves will control make-up water supply to the tank during low water demand period. i.e. night hours. Manual inlet valve will provide continuous water supply to the tank in case of electric valves failure.

For water storage tank schematic refer to drawing No. 7.

DOMESTIC COLD WATER RETICULATION

From main pumps room located next to the water storage tank water will be delivered to all outlets located in both residential towers.

Each tower is divided into three pressure zones:
- Mains pressure zone
- Low pressure zone – Zone 1
- High pressure zone – Zone 2

Maximum static pressure in each zone will not exceed 50m head.
Each pressure zone in both buildings is connected to pumping station.
Domestic cold water reticulation is shown on drawing No. 1

DOMESTIC HOT WATER RETICULATION

Both residential towers will have a common electric hot water generating plant and common hot water recirculation system divided into two pressure zones.

Hot water storage tanks will be pressurised by the mains or atmospheric pressure.
This system will provide equal cold and hot water pressure in each outlet.
Domestic hot water reticulation is shown on drawing No. 2.

FIRE HYDRANT AND FIRE SPRINKLER SYSTEM

Combined fire hydrant / fire sprinkler system will be installed in each tower.

Fire system is designed in accordance with AS2118.6-1995 requirements.

In case of fire signal from flow switch installed on main fire service line will turn the main pumps into the fire mode.

Same signal will close electrically operating valves on domestic water supply line saving entire water storage capacity for fire fighting usage. This valve will be monitored and manually tested on a weekly basis with a push button testing device. Operating pumps will increase flow and pressure, following current water demand.

In case of a mains power failure a stand-by power generator will automatically switch on providing power supply to all booster pumps. Pumping system will be manually reset into the normal operation mode after the fire. Modem connection with central building control unit and fire control room will be provided. For more details refer to Section A – Pumping System description. For fire services schematic refer to drawing No. 3. All isolating valves installed in combined fire service systems will be monitored.

CONCLUSIONS

Proposed single source water supply system for this project is new in Hydraulic Engineering and will create extremely reliable, efficient and energy saving water supply system for domestic and fire services installation.

SYSTEM ADVANTAGES

- **Reliability and fast response**
  All pumps are continuously tested during normal operation and ready to use for fire fighting all the time.

  Response time: less than 1 second.
  Stand-by power generator will provide uninterrupted power supply to all cold water / fire pumps.

- **Energy efficient and energy saving**
  All computer controlled pumps will use energy for current water demand only. Small jockey pumps will provide continuous water supply during night hours or low water demand period.

  Central Electric hot water system will manufacture hot water on demand only and main pumps will deliver hot water to all outlets. Circulating hot water pumps are not required. Hot water generating plant will be connected by modem to Central Building Control Unit.

  Central Energy Management Unit will control all systems including Air-Conditioning.

- **Water Savings**
  Routine weekly fire pumps testing is not required. During each 5.0 min duration pumps test water is dumped to the drain.

Water saving:	20l/s x 5.0min x 2 pumps = 12,000l for FH
	17l/s x 5.0min x 2 pumps = 10,000l for FS
Total water savings:	22,200l = 22.2m^3 / week

- **Safety**
  Proposed system will increase building and all occupants safety. Automatic water supply cut-off will provide extra warning in case of fire.

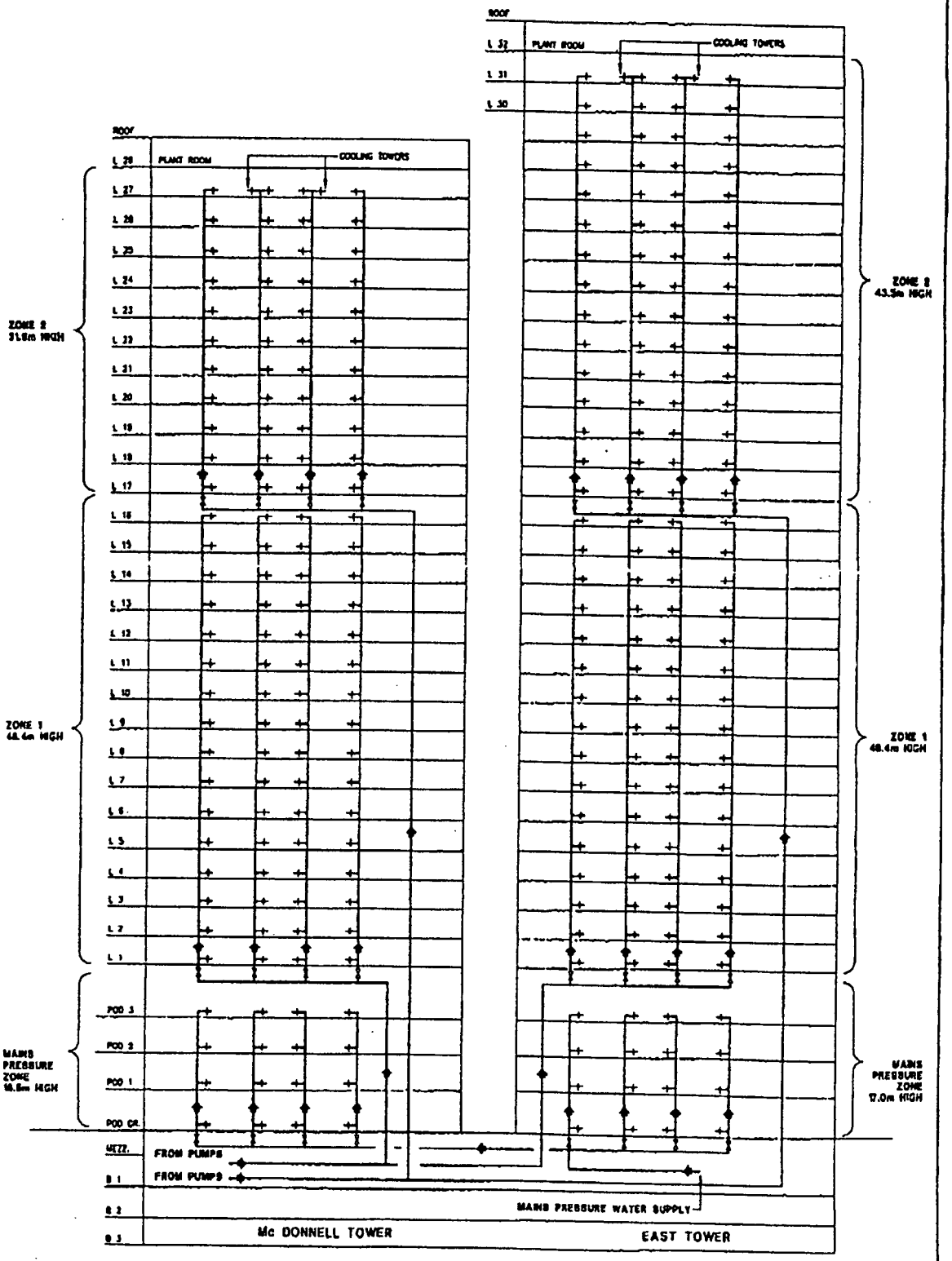
- **Easy operation control**
  Hot water generating plants and pumping station will have modem connection with central building control unit providing all information and technical data as hot water temperature and flow, cold water flow and pressure, hot and cold water usage etc. Building Control operator will be able to change pumps pressure form PC installed in Operations Room if required.

- **Low Maintenance Cost**
  Proposed system will provide substantial maintenance cost savings for cold and hot water installations, fire service and pumping station. Faulty pump can be replaced or removed for repair without interruption to hot and cold water supply.

SECTION C

SCHEMATIC DRAWINGS

• COLD WATER SYSTEM	DRAWING NO. 1
• HOT WATER SYSTEM	DRAWING NO. 2
• FIRE HYDRANT AND FIRE SPRINKLER SYSTEM	DRAWING NO. 3
• CENTRAL HOT WATER SYSTEM	DRAWING NO. 4
• DOMESTIC COLD WATER AND FIRE SERVICE PUMPING STATION	DRAWING NO. 5
• HOT WATER PUMPING STATION	DRAWING NO.6
• WATER STORAGE TANK DETAIL	DRAWING NO.7



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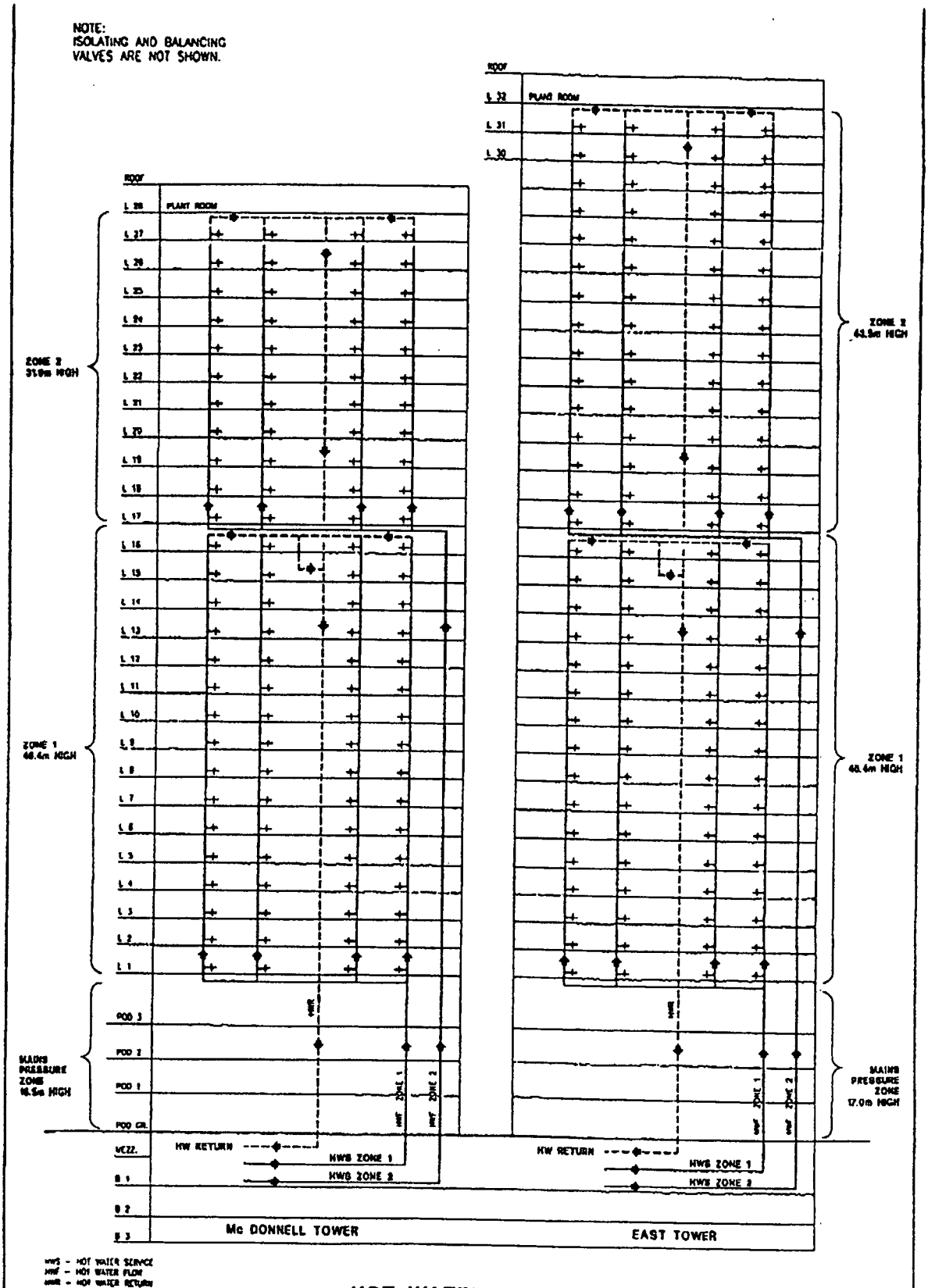
COLD WATER SYSTEM
SCHEMATIC
N.T.S.

DRG NO. 1



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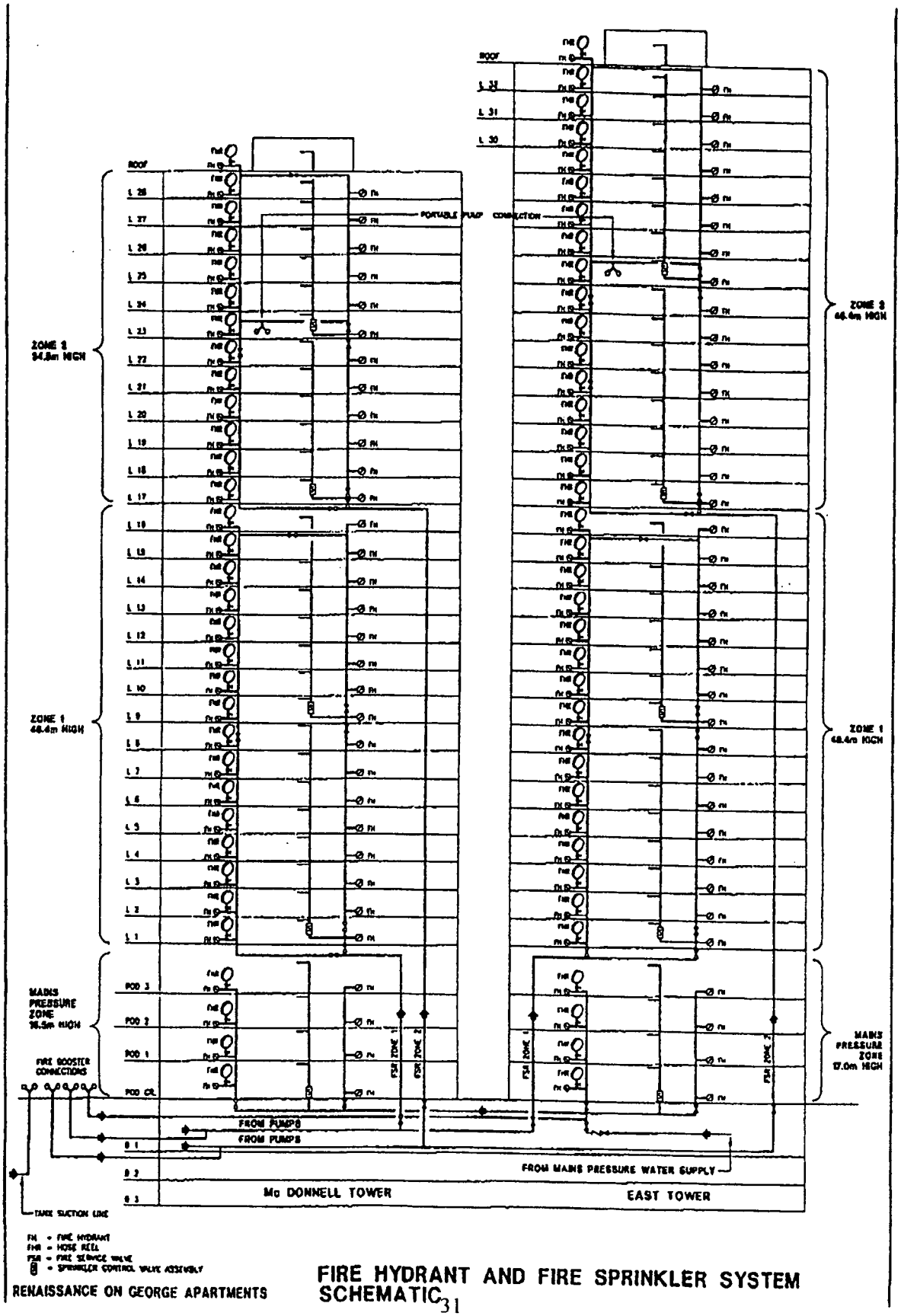
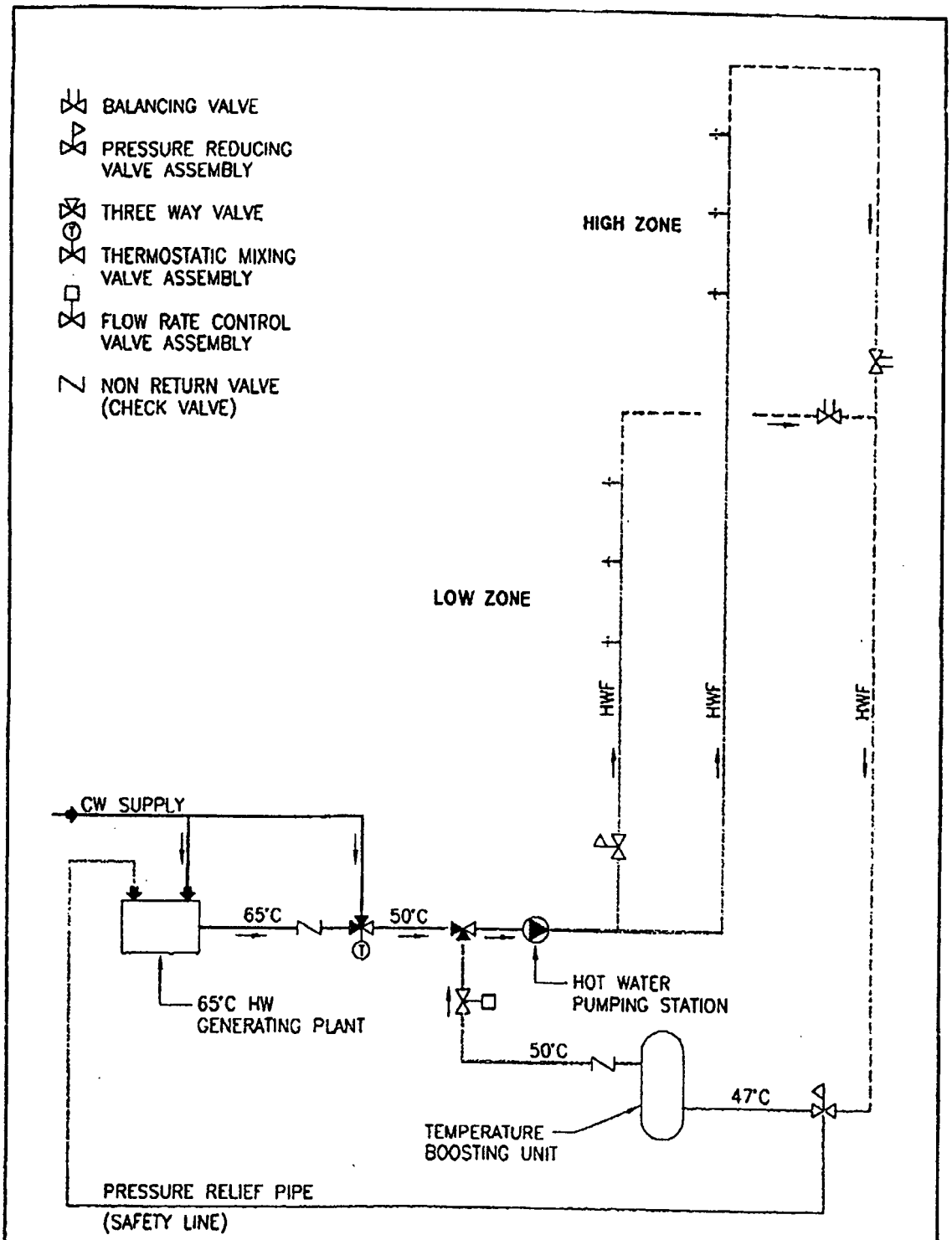
HOT WATER SYSTEM
SCHEMATIC

DRG NO 2



FIRE HYDRANT AND FIRE SPRINKLER SYSTEM SCHEMATIC



CENTRAL HOT WATER SYSTEM DESIGN PHILOSOPHY

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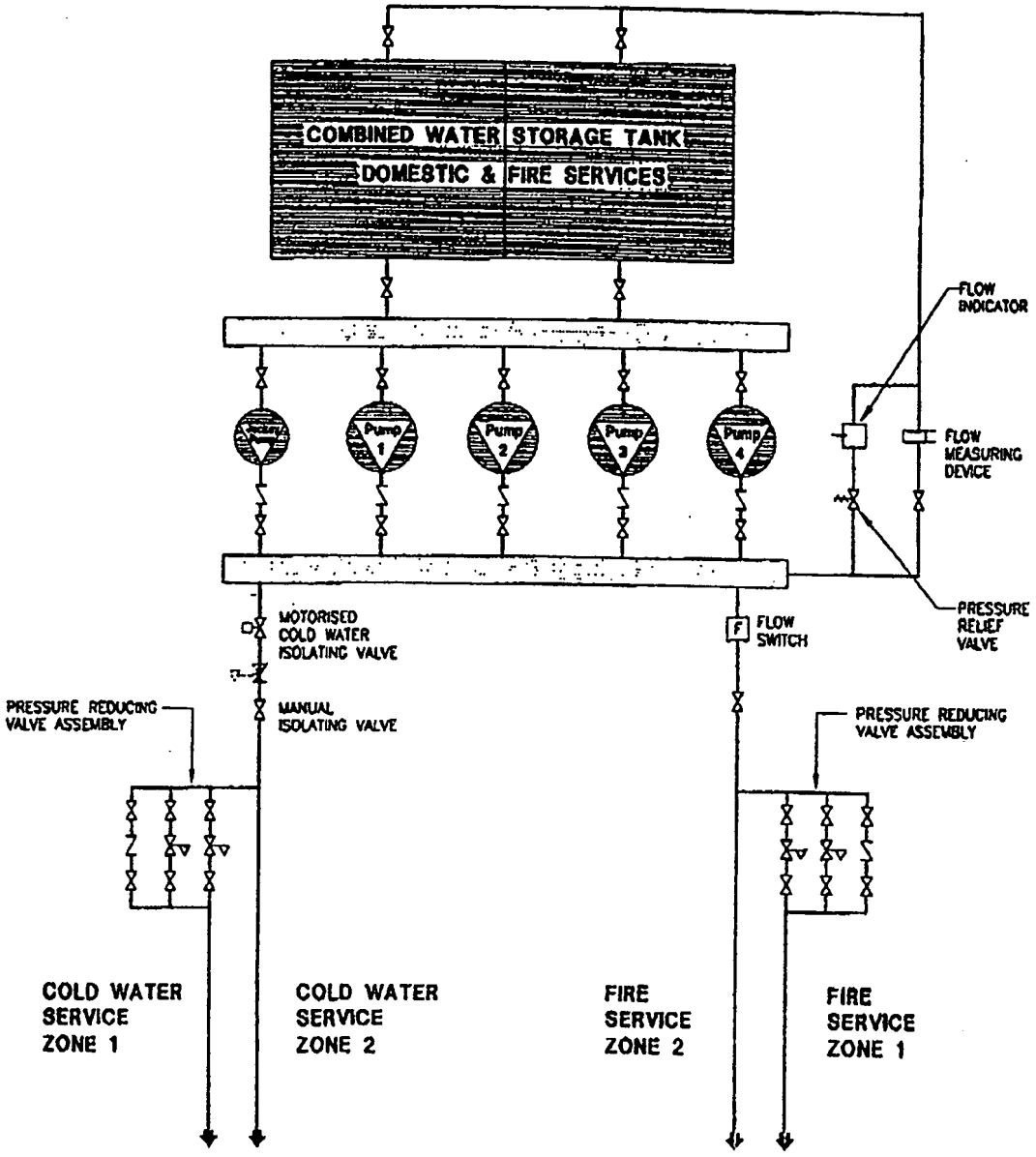

DOMESTIC COLD WATER AND FIRE SERVICE PUMPING STATION

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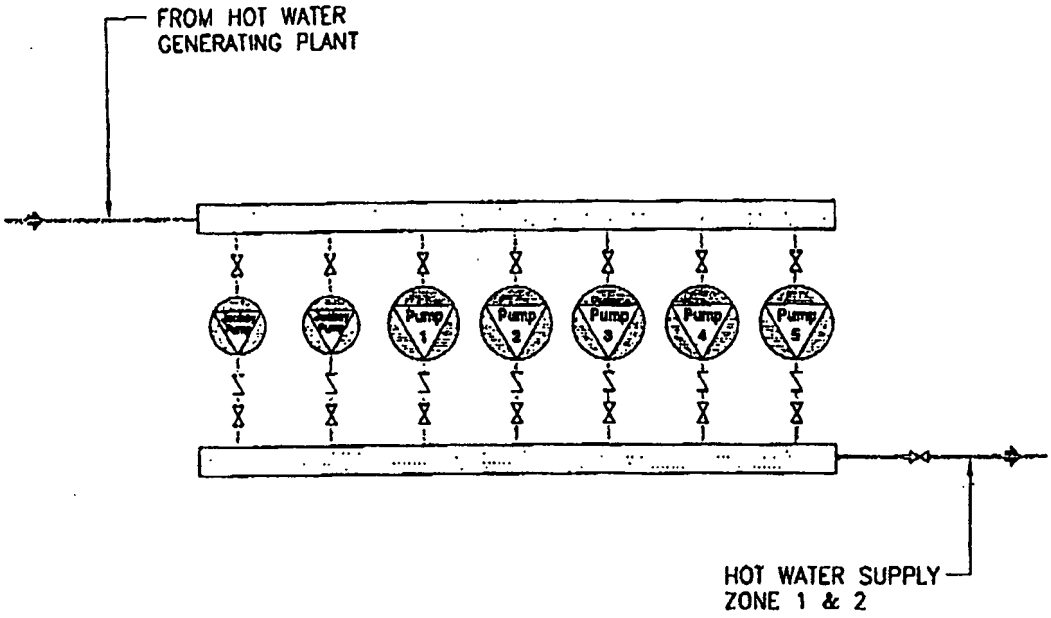

HOT WATER PUMPING STATION

N.T.S.

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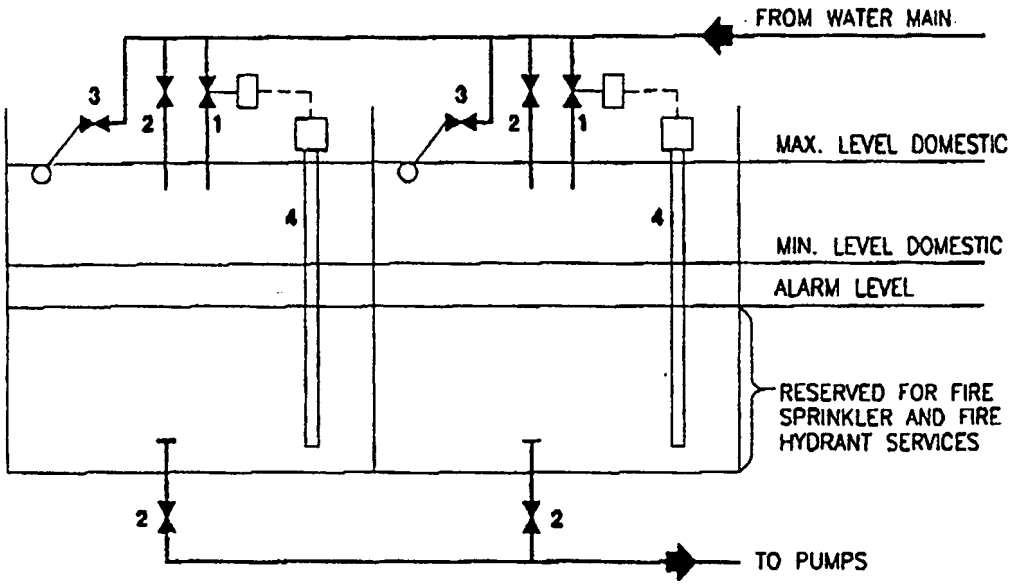
DRG NO. 6



1 - ELECTRICALLY DRIVEN VALVES
2 - MANUAL VALVES
3 - FLOAT VALVES (MAKE-UP WATER)
4 - ELECTRONIC LEVEL CONTROL DEVICE

WATER STORAGE TANK DETAIL

N.T.S.

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DRG NO. 7

CLAIMS

1. A water supply apparatus for a water usage area, the apparatus including

a fire water reticulation means;

a domestic water reticulation means; and

a water supply means for supplying water to the water usage area, the fire water reticulation means and the domestic water reticulation means being operatively coupled to the water supply means.

2. The water supply apparatus as claimed in claim 1, in which the domestic water reticulation means and the fire water reticulation means are divided into a lower reticulation zone and at least one upper reticulation zone, the lower reticulation zone being mountable in a lower portion of a building, and the, or each, upper reticulation zone being mountable in a respective upper level of the building.

3. The water supply apparatus as claimed in claim 2, in which the domestic water reticulation means and the fire water reticulation means are divided into a lower reticulation zone and an upper reticulation zone.

4. The water supply apparatus as claimed in claim 2 or claim 3, which includes a water storage means, in which water for the domestic water reticulation means and for the fire water reticulation means is stored.

5. The water supply apparatus as claimed in claim 4, which includes a single water storage means.

6. The water supply apparatus as claimed in claim 5, in which the water storage means includes at least one water tank.

7. The water supply apparatus as claimed in any one of claims 3 to 6, inclusive, which includes a pumping means, which is arranged in fluid communication between the water storage means and the domestic and fire water reticulation means to pump water through the domestic and fire water reticulation means.

8. The water supply apparatus as claimed in claim 7, in which the pumping means includes one pumping station, which is arranged in fluid communication between the water storage means and both the lower and upper zones of the domestic and fire water reticulation means to pump water to both the lower and upper reticulation zones.

9. The water supply apparatus as claimed in claim 7 in which the pumping means includes at least two pumping stations, a pumping station being arranged in fluid communication between the water storage means and each respective reticulation zone of the domestic and fire water reticulation means to pump water to each reticulation zone, respectively.

10. The water supply apparatus as claimed in claim 8 or claim 9, in which each pumping station includes a number of pump sets, each pump set including a pump and a motor.

11. The water supply apparatus as claimed in any one of claims 8 to 10, inclusive, which includes a sensing means for sensing pressure and flow characteristics of water pumped from the, or each pumping station.

12. The water supply apparatus as claimed in claim 11, which includes a control means for controlling pressure and flow characteristics of water pumped from the, or each, pumping station.

13. The water supply apparatus as claimed in claim 12, in which the control means is operable on receipt of a signal from the sensing means.

14. The water supply apparatus as claimed in claim 8, which includes a water conduit means arranged in fluid communication between the pumping station and each reticulation zone of the domestic and fire water reticulation means.

15. The water supply apparatus as claimed in claim 9, which includes a water conduit means arranged in fluid communication between each pumping station and its respective reticulation zone of the domestic and fire water reticulation means.

16. The water supply apparatus as claimed in any one of the preceding claims, in which the domestic water reticulation means includes a cold water reticulation means and a hot water reticulation means.

17. The water supply apparatus as claimed in claim 16, which includes a hot water generating means.

18. A building which includes a water supply apparatus having a domestic water reticulation means and a fire water reticulation means, the domestic water reticulation means and the fire water reticulation means being connectable to a single water source, in parallel with each other.

19. A water supply apparatus for reticulating water services to a building, the apparatus including:

a water storage means for storing water to be reticulated;

a water pumping means operatively communicating with the water in the water storage means by means of a conduit means;

a domestic water reticulation means for reticulating domestic water in the building operatively connected to the water pumping means; and

a fire water reticulation means for reticulating fire water in the building also operatively connected to the water pump means.

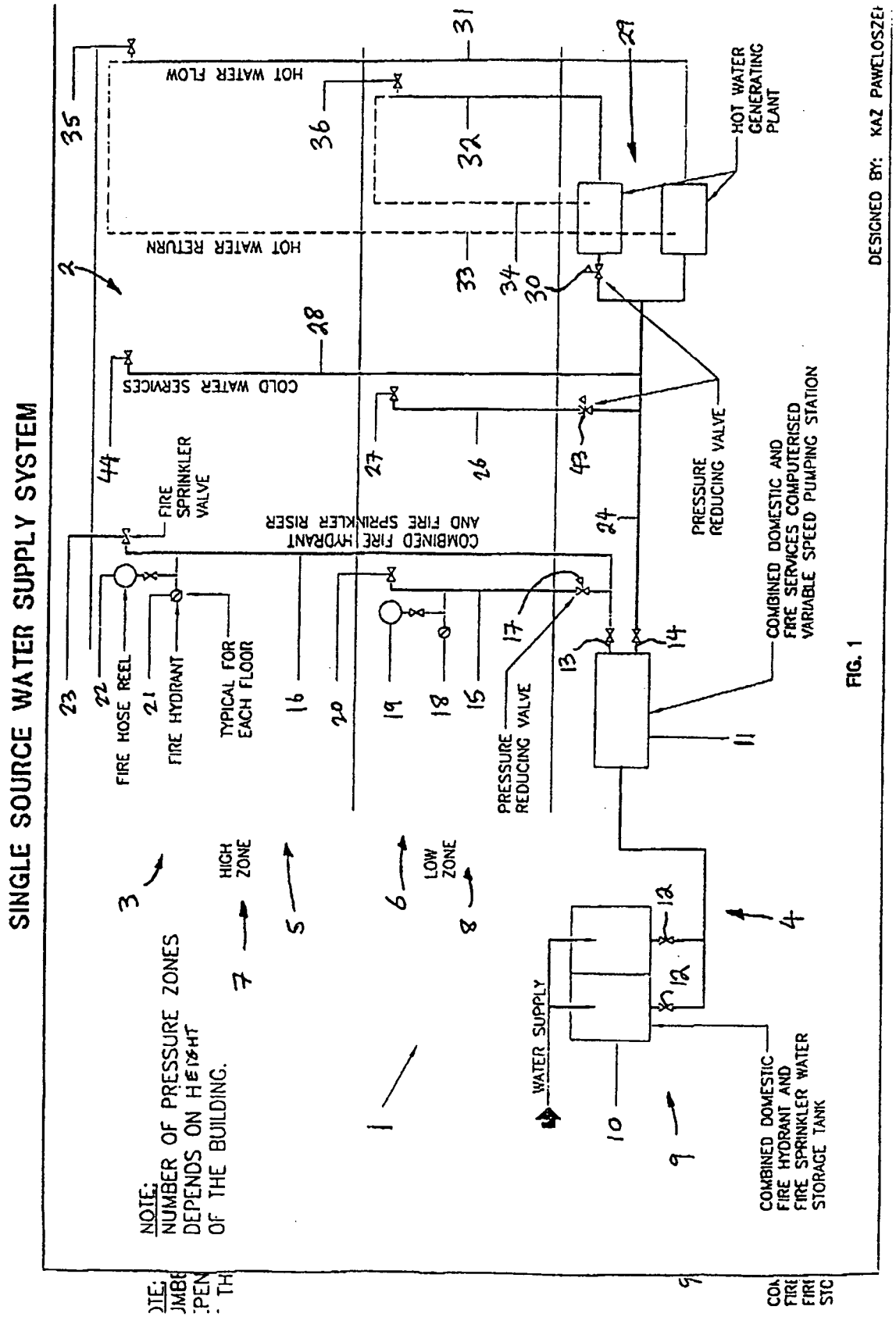
20. A water supply apparatus according to claim 19 wherein the domestic water reticulation means includes a plurality of zones corresponding to differing levels of height in the building, including a relatively lower reticulation zone for serving a relatively lower level of the building and a relatively higher reticulation zone for servicing a corresponding relatively higher level of the building, and wherein the fire water reticulation means also includes a plurality of portions corresponding to different levels in the building, including a relatively lower reticulation zone for servicing a relatively lower level of the building, and a relatively higher reticulation zone for servicing a corresponding relatively higher level of the building.

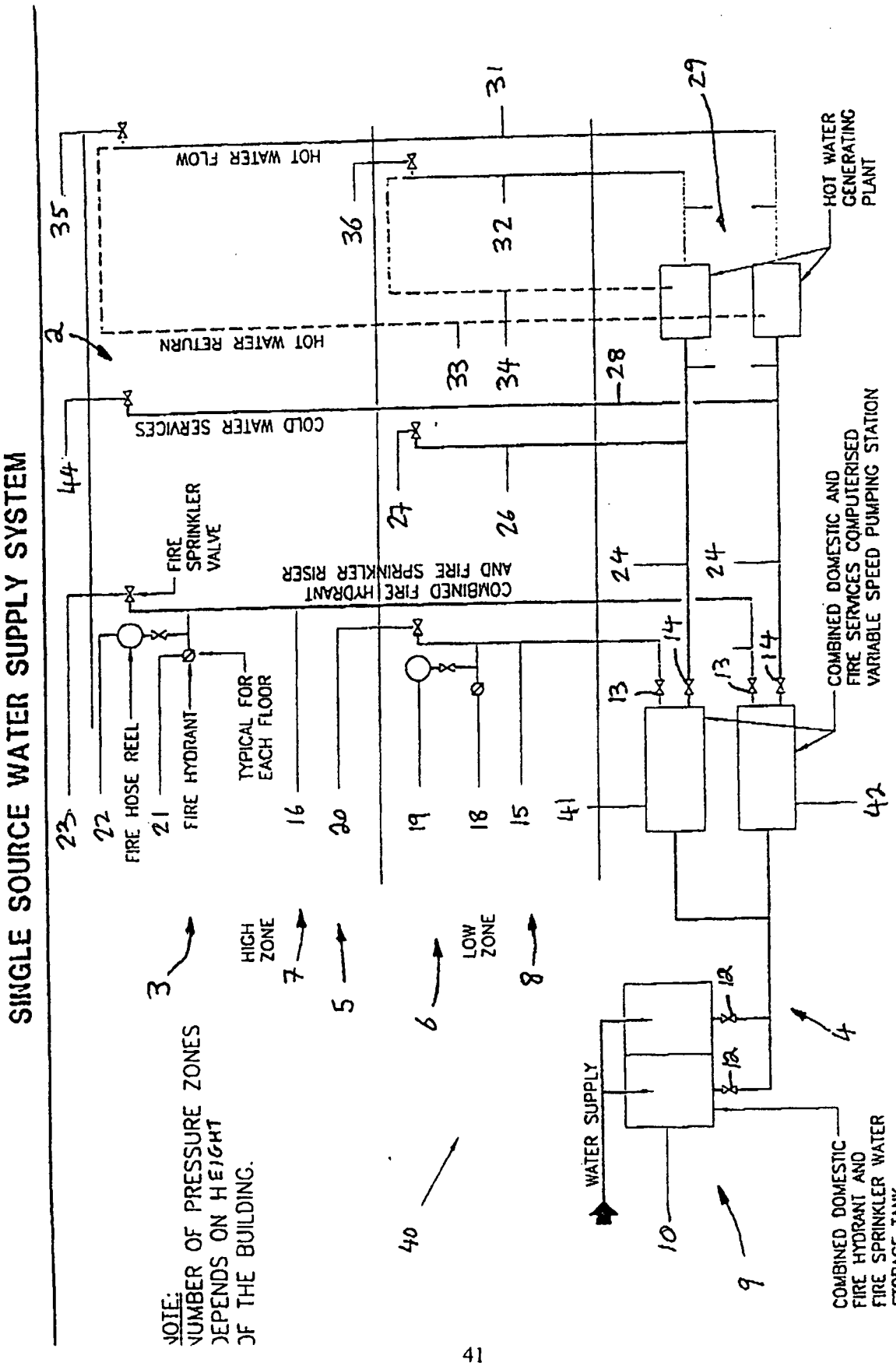
21. A water supply apparatus according to claim 20 wherein the pumping means includes a relatively higher pressure pumping station and a relatively lower pressure pumping station, and wherein said lower reticulation zones of said fire water and domestic water reticulation means are operatively coupled to said relatively lower pressure pumping stations, and said upper reticulation zones of said domestic and fire water reticulation means are operatively coupled to said relatively higher pressure pumping stations.

22. A water supply apparatus according to claim 21, wherein the pumping means delivers water at a single delivery pressure for use throughout the building and wherein pressure reducing means are operatively coupled in line with said lower reticulation portions of said domestic water and fire water reticulation means for limiting the water supply in said lower portions within predetermined pressure limits.

23. A water supply apparatus according to any one of claims 19 to 22, wherein the water pumping means draws water from a common water storage means.

24. A new water supply apparatus for a water usage area, substantially as described herein, with reference to the accompanying drawings and the accompanying appendix.


SINGLE SOURCE WATER SUPPLY SYSTEM
NOTE:
NUMBER OF PRESSURE ZONES
DEPENDS ON HEIGHT
OF THE BUILDING.
HOT WATER FLOW
HOT WATER RETURN
COLD WATER SERVICES
COMBINED FIRE HYDRANT
AND FIRE SPRINKLER RISER
FIRE SPRINKLER VALVE
FIRE HOSE REEL
FIRE HYDRANT
TYPICAL FOR EACH FLOOR
HIGH ZONE
LOW ZONE
PRESSURE REDUCING VALVE
PRESSURE REDUCING VALVE
HOT WATER GENERATING PLANT
COMBINED DOMESTIC AND FIRE SERVICES COMPUTERISED VARIABLE SPEED PUMPING STATION
WATER SUPPLY
COMBINED DOMESTIC FIRE HYDRANT AND FIRE SPRINKLER WATER STORAGE TANK
DESIGNED BY: KAZ PAWELOSZEK
FIG. 1


SINGLE SOURCE WATER SUPPLY SYSTEM
HOT WATER FLOW
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COMBINED DOMESTIC FIRE HYDRANT AND FIRE SPRINKLER WATER STORAGE TANK
NOTE:
NUMBER OF PRESSURE ZONES DEPENDS ON HEIGHT OF THE BUILDING.
DESIGNED BY: KAZ PAWELOSZE

FIG. 2

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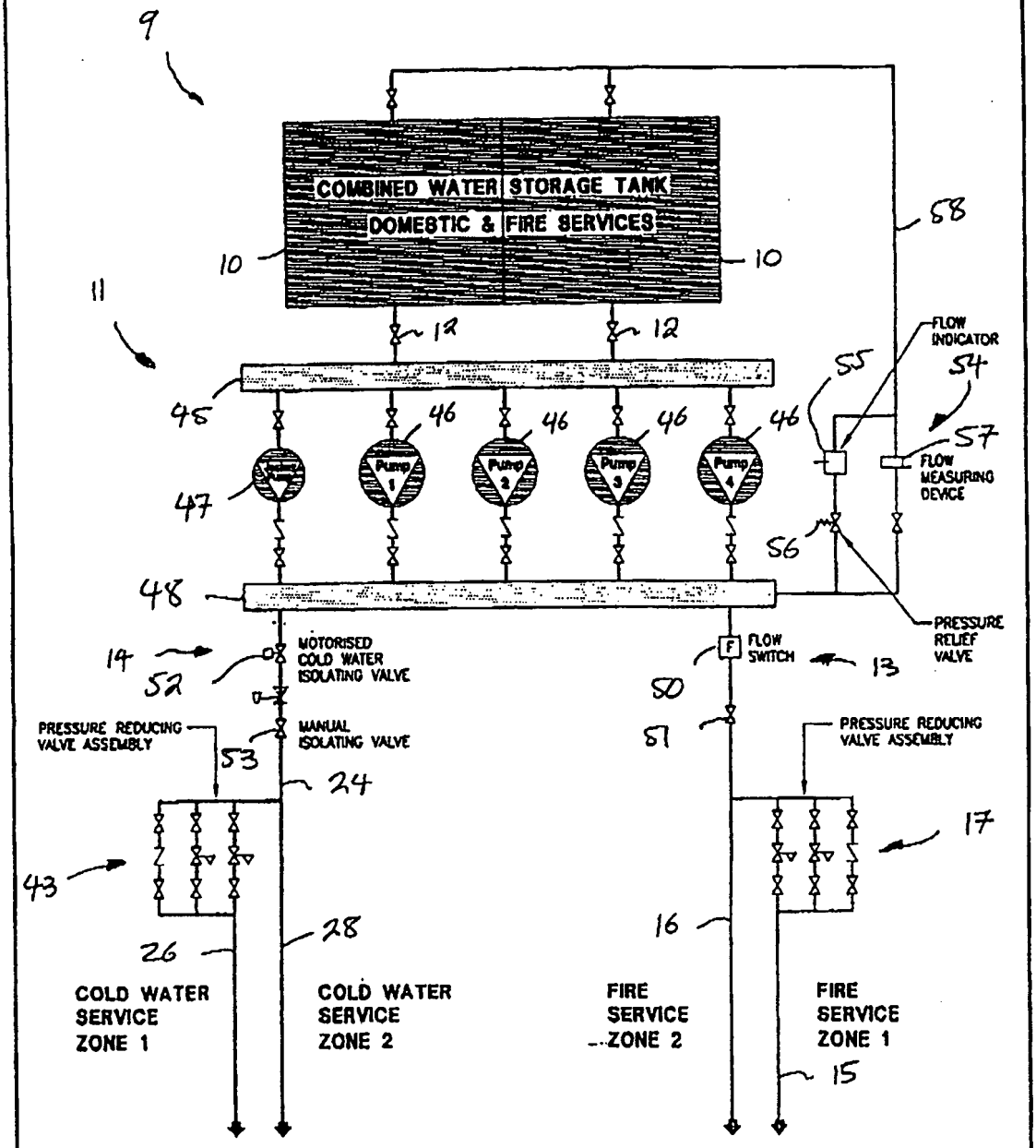

FIG 3

DOMESTIC COLD WATER AND FIRE SERVICE PUMPING STATION

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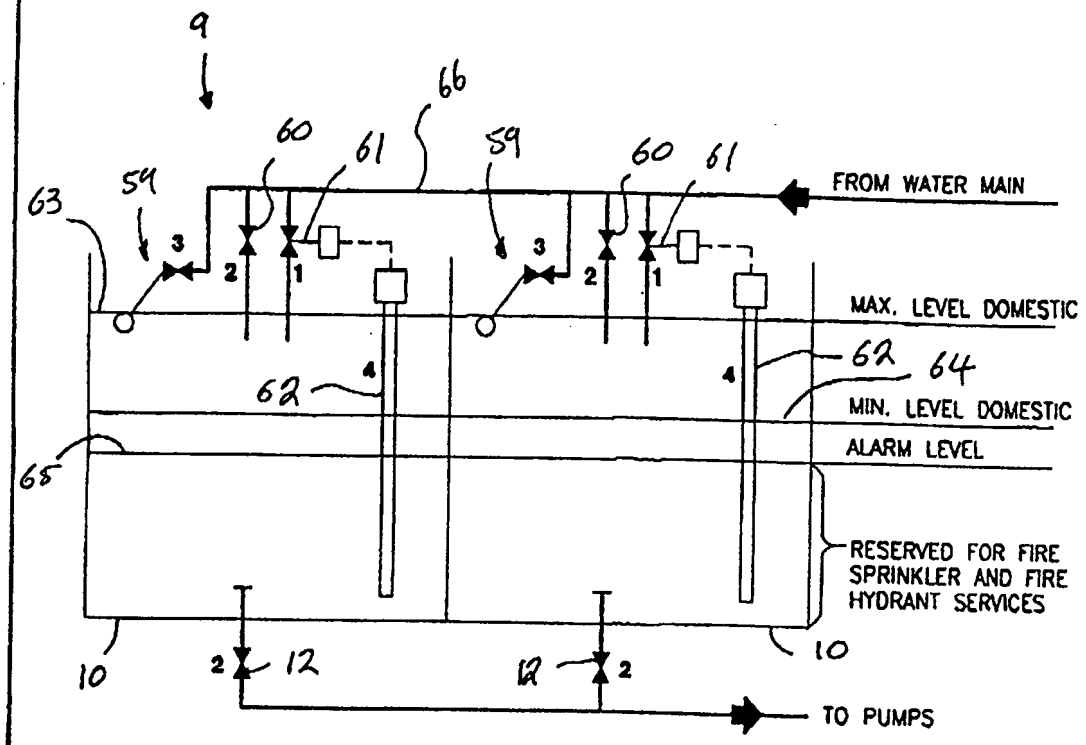

1 – ELECTRICALLY DRIVEN VALVES
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4 – ELECTRONIC LEVEL CONTROL DEVICE

FIG 4.

WATER STORAGE TANK DETAIL

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DRG NO. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 99/00502

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: E03B 5/02, 7/00, A2C 35/64

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC E03B 5/02, 7/00, 7/02, 7/04, 9/00, A62C 35/64

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU:IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3294105 A (SCHAUB) 27 December 1996 See entire document	1
X	Derwent Abstract Accession No. E8679 A/24, Class Q42 SU 566908 A (FEDOTOV K.B) 5 August 1977 See entire Abstract.	1
X	Derwent Abstract Accession No. E2164 C/19, Class Q42, SU 684104 A, (MOSC. TYP , EXP. DES) 15 September 1979 See entire Abstract	1

☐ Further documents are listed in the continuation of Box C

☐ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 August 1999	10 AUG 1999
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Authorized officer R. WEBER Telephone No.: (02) 6283 2546

Gibson, Lynda E (15361)

From: Betts O'Toole [BETTS.do.wfb@wfbschools.com]
Sent: Thursday, June 07, 2007 3:09 PM
To: Matt Wolfert; Steve Kuhnen; Scrivner, Thomas W (14965); Harry Moulopoulos; Carlynn Alt; Sandy Murphy; Bob Bruch; Brad Hampel; Bill Henkle; David Kern; Gary Siegman; John Gustavson; Jim Rickabaugh; Lisa Gies; Mark Tenorio; Nathan Joynt; Sara Alter; Shawn Yde; Tony Frontier; Doug Armstrong; Katie Commer; Nancy LeGrand; Ron Kuramoto; Ed Corrigan
Subject: FSC Draft 6/4 Minutes & 6/25 Agenda

Attachments: 6-4 FSC minutes.doc; 6-25-07 FSC Agenda.doc


6-4 FSC minutes.doc (40 KB)


6-25-07 FSC genda.doc (32 KB).